

## CLAIMS

What is claimed is:

1. In a traffic monitoring system having a sensor, a method for defining traffic lanes, comprising the steps of:

- a. for a selectable plurality of vehicles,
  - i. detecting each of said selectable plurality of vehicles present within a field of view of said sensor;
  - ii. estimating a position of said each of said selectable plurality of vehicles;
  - iii. recording said position of said each of said selectable plurality of vehicles;
- b. generating a probability density function estimation from each of said position of said each of said selectable plurality of vehicles; and
- c. defining said traffic lanes within said traffic monitoring system from said probability density function estimation.

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2. The method as recited in claim 1 wherein said detecting each of said selectable plurality of vehicles step comprises the steps of:

- a. transmitting from said sensor an electromagnetic signal of a known power toward said traffic lanes; and
- b. measuring at said sensor a reflected power corresponding to a portion of said electromagnetic signal as reflected from each of said selectable plurality of vehicles.

3. The method as recited in claim 1 wherein said estimating a position step comprises the step of:

- a. partitioning said field of view of said sensor into range bins wherein each of said traffic lanes includes a plurality of range bins each having a received power range associated therewith; and
- b. assigning said position of said each of said selectable plurality of vehicles to a corresponding one of said range bins when said reflected power from each of said selectable plurality of vehicles corresponds with said reflected power range of said corresponding one of said plurality of range bins.

4. The method as recited in claim 3 wherein said generating a probability density function comprises the step of:

- a. generating a histogram of said positions within said plurality of range bins.

5. The method as recited in claim 4 wherein said defining said traffic lanes comprises the steps of:

- a. identifying probability peaks on said histogram of said positions;  
and
- b. defining boundaries around each of said probability peaks, said boundaries about each of said probability peaks representing one of said traffic lanes therebetween.

6. The method as recited in claim 1 wherein said generating a probability density function estimation further comprises the step of:

- a. weighting for more statistical significance more recent ones of each of said positions of each of said selectable plurality of vehicles than stale ones of each of said positions.

7. The method as recited in claim 1 further comprising the steps of:
  - a. assigning a traffic flow direction to said position of said each of said selectable plurality of vehicles;
  - b. recording said traffic flow direction to said position of said each of said selectable plurality of vehicles;
  - c. generating probability density function estimations for each of said traffic flow directions; and
  - d. assigning said traffic flow directions to said traffic lanes.

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8. A sensor for defining traffic lanes in a traffic monitoring system,  
comprising:

- a. a transceiver for detecting each of a selectable plurality of vehicles present within a field of view of said transceiver; and
- b. a processor including executable instructions for performing the steps of:
  - i. estimating a position of said each of said selectable plurality of vehicles;
  - ii. recording said position of said each of said selectable plurality of vehicles; for a selectable plurality of vehicles
  - iii. generating a probability density function estimation from each of said position of said each of said selectable plurality of vehicles; and
  - iv. defining said traffic lanes within said traffic monitoring system from said probability density function estimation.

9. The sensor as recited in claim 8 wherein said transceiver comprises:

- a. a transmitter for transmitting an electromagnetic signal of a known power toward said traffic lanes; and
- b. a receiver for receiving a reflected power corresponding to a portion of said electromagnetic signal as reflected from each of said selectable plurality of vehicles.

10. The sensor as recited in claim 8 wherein said processor further includes executable instructions for performing the steps of:

- a. partitioning said field of view of said sensor into range bins wherein each of said traffic lanes includes a plurality of range bins each having a received power range associated therewith; and
- b. assigning said position of said each of said selectable plurality of vehicles to a corresponding one of said range bins when said received power from each of said selectable plurality of vehicles corresponds with said received power range of said corresponding one of said plurality of range bins.

11. The sensor as recited in claim 10 wherein said processor further includes executable instructions for performing the step of:

- a. generating a histogram of said positions within said plurality of range bins.

12. The sensor as recited in claim 11 wherein said executable instructions for defining said traffic lanes further comprises executable instructions for performing the steps of:

- a. identifying probability peaks on said histogram of said positions;  
and
- b. defining boundaries around each of said probability peaks, said boundaries about each of said probability peaks representing one of said traffic lanes therebetween.

13. The sensor as recited in claim 8 wherein said executable instructions for performing the steps of generating a probability density function estimation further comprises executable instructions for performing the step of:

- a. weighting for more statistical significance more recent ones of each of said positions of each of said selectable plurality of vehicles than stale ones of each of said positions.

14. The sensor as recited in claim 8 further comprising executable instructions for performing the steps of:

- a. assigning a traffic flow direction to said position of said each of said selectable plurality of vehicles;
- b. recording said traffic flow direction to said position of said each of said selectable plurality of vehicles;
- c. generating probability density function estimations for each of said traffic flow directions; and
- d. assigning said traffic flow directions to said traffic lanes.





16. The computer-readable medium as recited in claim 15 wherein said computer executable instructions for performing the steps of detecting each of said selectable plurality of vehicles comprises computer executable instructions for performing the steps of:

- a. transmitting from said sensor an electromagnetic signal of a known power toward said traffic lanes; and
- b. measuring at said sensor a reflected power corresponding to a portion of said electromagnetic signal as reflected from each of said selectable plurality of vehicles.

17. The computer-readable medium as recited in claim 15 wherein said computer executable instructions for performing the steps of estimating a position step comprise computer executable instructions for performing the steps of:

- a. partitioning said field of view of said sensor into range bins wherein each of said traffic lanes includes a plurality of range bins each having a received power range associated therewith; and
- b. assigning said position of said each of said selectable plurality of vehicles to a corresponding one of said range bins when said reflected power from each of said selectable plurality of vehicles corresponds with said reflected power range of said corresponding one of said plurality of range bins.

18. The computer-readable medium as recited in claim 17 wherein said computer executable instructions for performing the step of generating a probability density function comprises computer executable instructions for performing the step of:

- a. generating a histogram of said positions within said plurality of range bins.

19. The computer-readable medium as recited in claim 18 wherein said computer executable instructions for performing the step of defining said traffic lanes comprises computer executable instructions for performing the steps of:

- a. identifying probability peaks on said histogram of said positions;  
and
- b. defining boundaries around each of said probability peaks, said boundaries about each of said probability peaks representing one of said traffic lanes therebetween.

20. The computer-readable medium as recited in claim 15 wherein said computer executable instructions for performing the step of generating a probability density function estimation further comprises computer executable instructions for performing the step of:

- a. weighting for more statistical significance more recent ones of each of said positions of each of said selectable plurality of vehicles than stale ones of each of said positions.

21. The computer-readable medium as recited in claim 15 wherein said computer executable instructions further comprise computer executable instructions for performing the steps of:

- a. assigning a traffic flow direction to said position of said each of said selectable plurality of vehicles;
- b. recording said traffic flow direction to said position of said each of said selectable plurality of vehicles;
- c. generating probability density function estimations for each of said traffic flow directions; and
- d. assigning said traffic flow directions to said traffic lanes.